



The Desert Fireball Network (Finding Meteorites with Orbits)

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Plus a lot of volunteers, mostly Australians...

- There are over 30,000 **Meteorites** in the Earth's collections
Where do they all come from?
- There is **SIGNIFICANT SCIENCE** potential from having orbital data for meteorites
- Sample + orbit, gives **context**

For example:

Linking meteorites with probable NEO parents

Do any meteorites originate from comets?

• Which meteorite types come from where, and what do they look like?

→ Map of Solar System composition

Impact rate of meteorites on the Earth?

- Recovery rates for previous networks is very low:

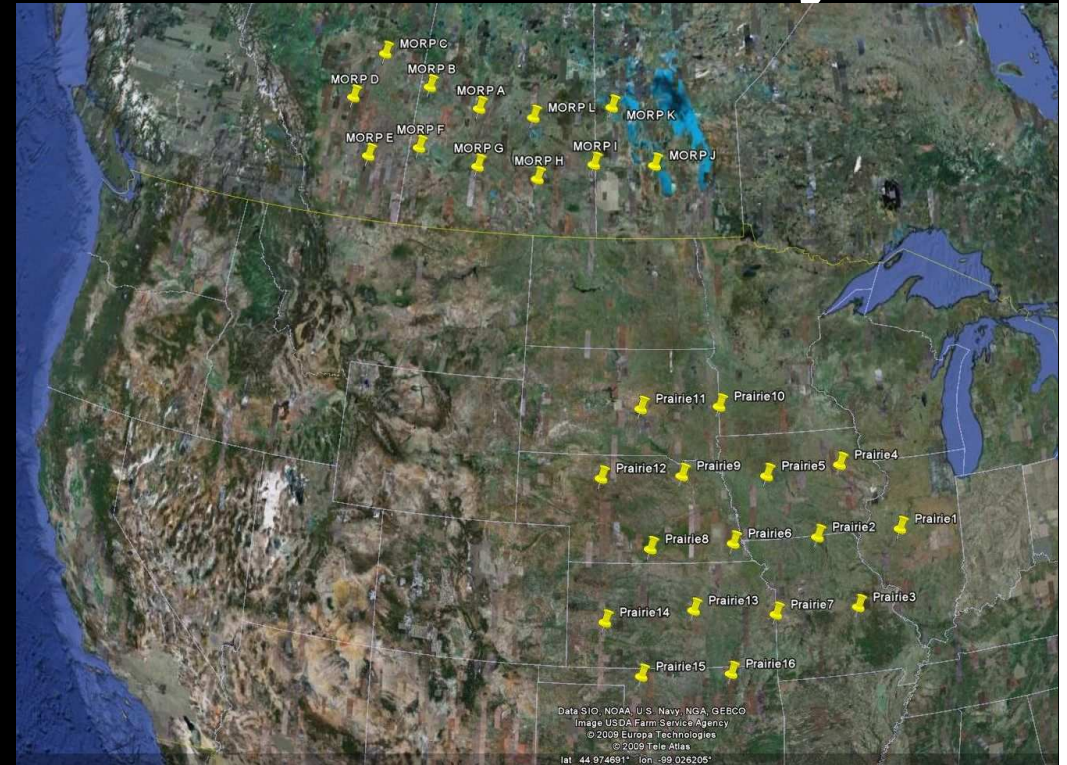
- In 1960-70's, 12-16 stations:
 - 'MORP' was Canadian
 - 'Prairie' was in USA

- But...
 - 10's years of observations, 1000's of fireballs



only four meteorites with orbits recovered

- **Location** meteorites are hard to find in vegetated areas



Desert Fireball Network

Instead,

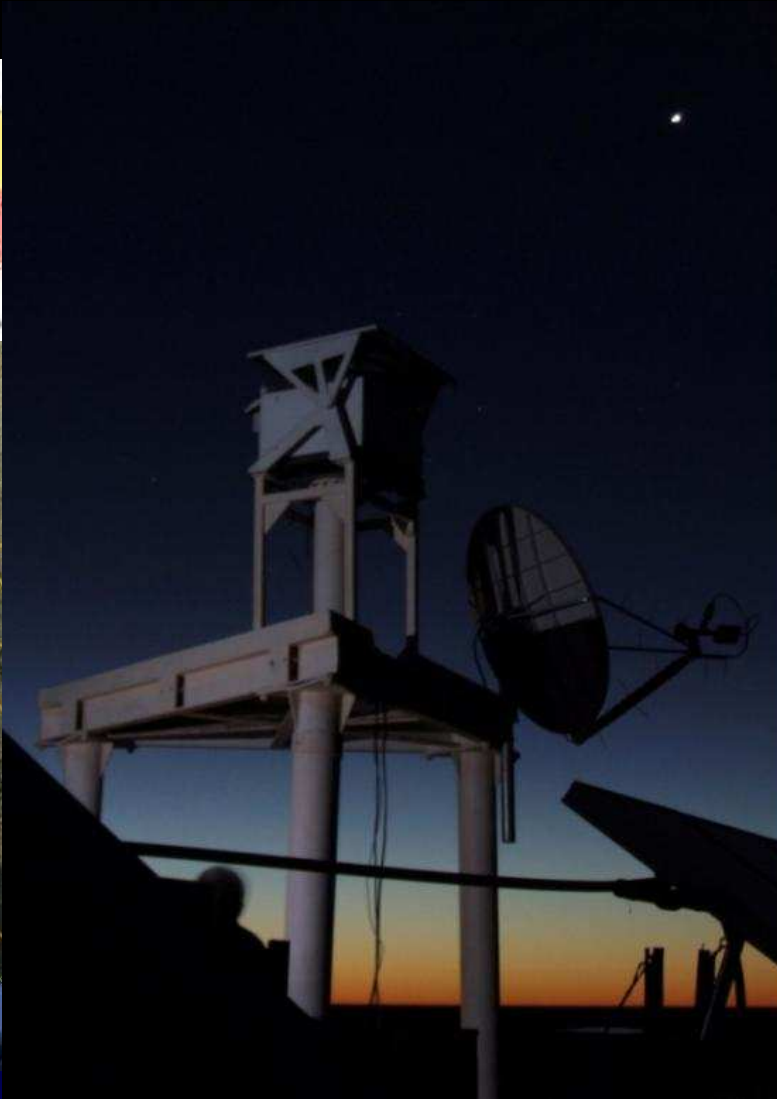
put a camera network in a place where we can find meteorites; the **Nullarbor Plain**, in **Australia**

- It is basically a huge slab of limestone; it has
 - flat terrain,
minimal vegetation,
white rock.
 - (all good for searching for black meteorites)
- It also has good weather!
 - Clear skies to see plenty of meteors
 - No rain to pollute meteorites

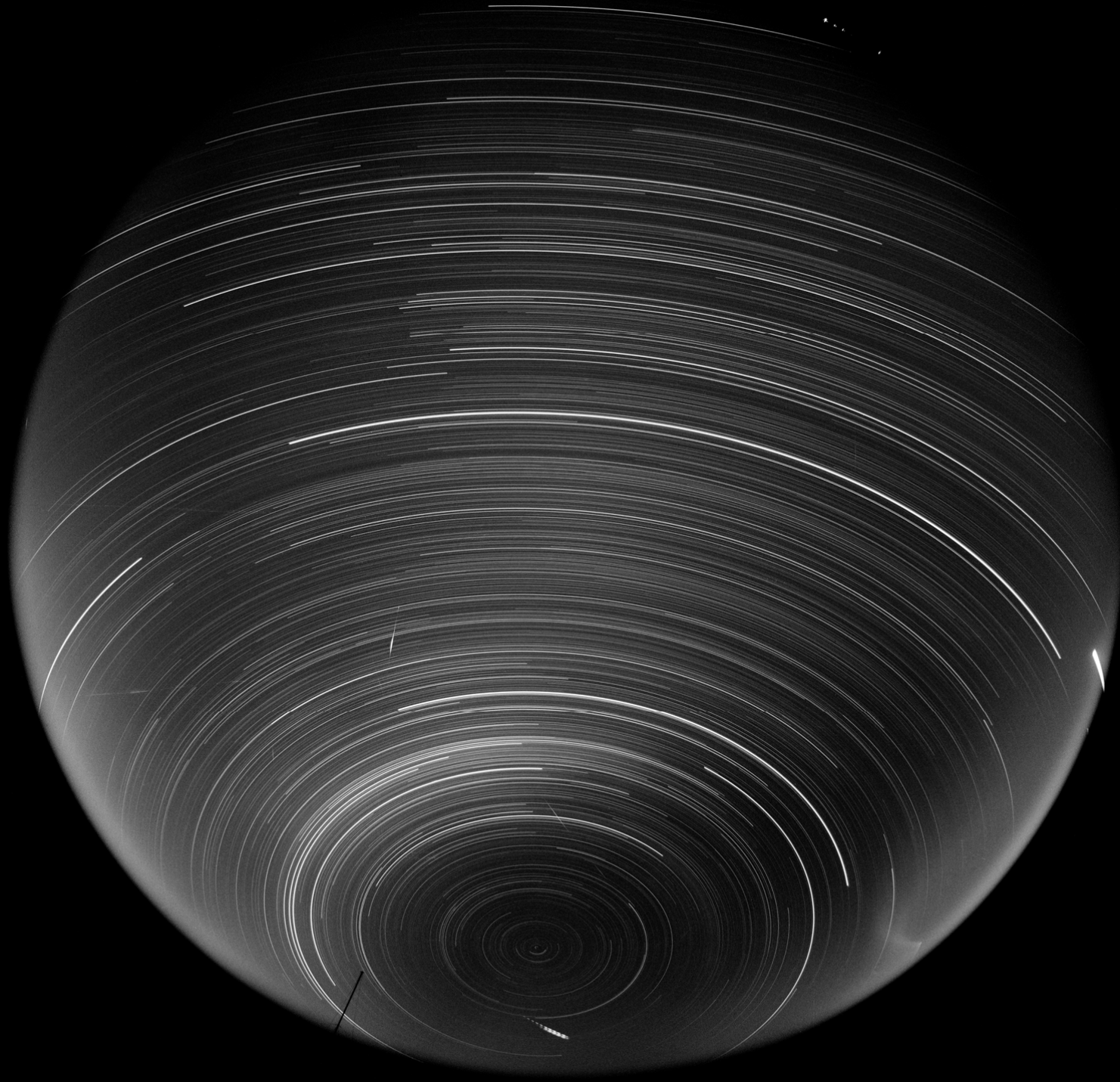


Desert Fireball Network

- A network of **Autonomous Fireball Observatories**







1st meteorite recovered

First DFN search took place in October 2008 -

- A great success!
- 1st stone with mass of **150g** found 97m south of predicted fall line
- 2nd stone with mass of **174g** found 39m north of predicted line
- Meteorite is named **Bunburra Rockhole** after 'nearby' landscape structure



Second DFN search took place in March 2009

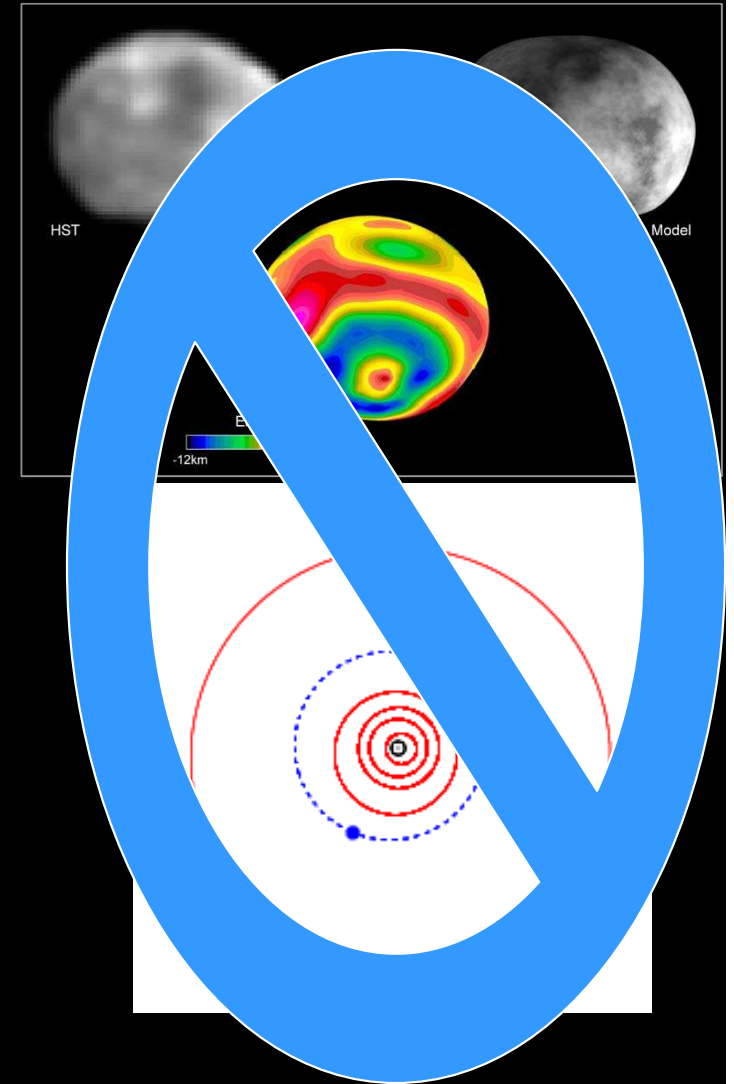
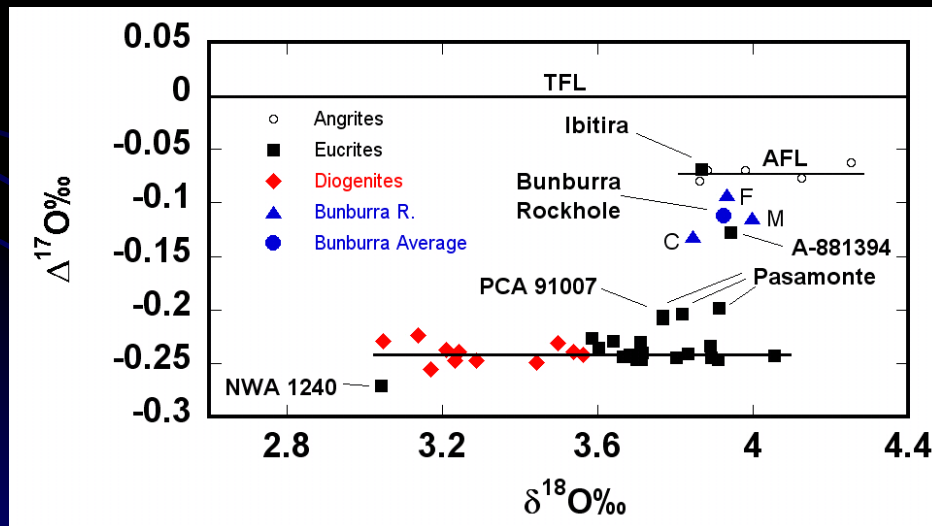
- **15g** found about 100m off predicted fall line, about 10km East of previous falls





Bunburra Rockhole

- It is basaltic. A Eucrite from (4)Vesta?
- Oxygen isotope analysis says 'no'

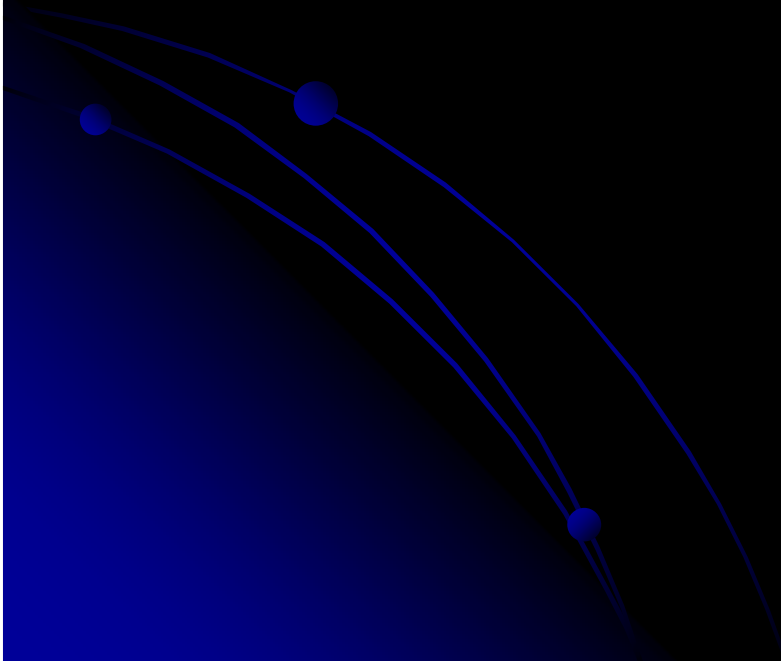
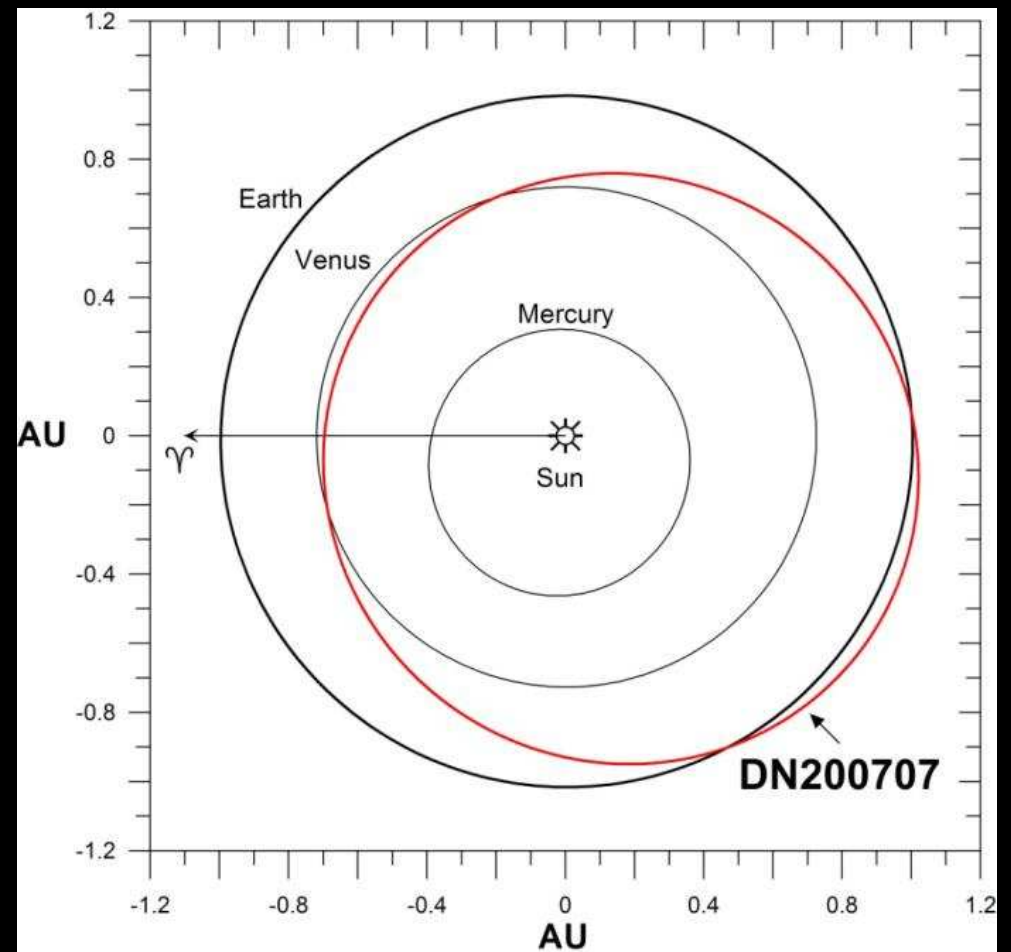


The orbit and it's evolution

Bunburra Rockhole delivered from an **Aten**-type orbit.

Using numerical method of Bottke et al. (2002), we generate a probability that an object came from a specific NEO source region

- Probability of Bunburra Rockhole coming originally from the innermost region of the main belt is **98%**



Implications

The parent body of Bunburra Rockhole would be classified as V-type asteroid (based on pyroxene spectra)

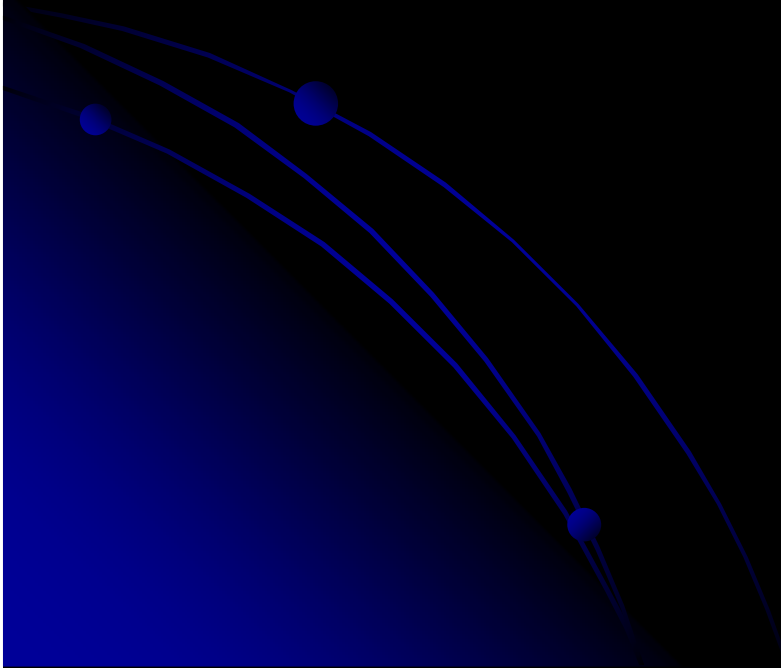
- There are quite a few V-types in the inner asteroid belt,
 - currently presumed not part of the Vesta family, but difficult to prove they *didn't* come from Vesta originally.
(Carruba et al. 2003, 2005)

- **But,**
we now have compositional as well as dynamical data

- **Hence,**
we have evidence that some of these V-type asteroids are ***unrelated*** to (4) Vesta

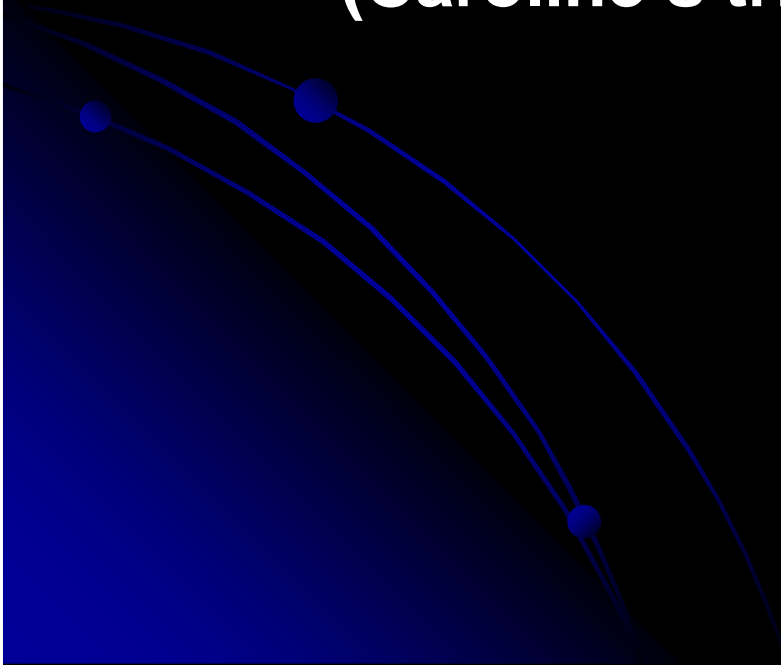


This week...



Blogs of trips:

- www.desertfireballnetwork.org
 - (my trip, next week)
- And
- <http://www.nhm.ac.uk/natureplus/blogs/meteorites>
 - (Caroline's trip – already underway)



Digital

- Film vs. CCD
 - Equivalent resolution of about 900MegaPix
 - But changing the films is a real pain,
 - And the cameras have lots of finely tuned mechanical parts....
they don't really like the dusty, 50°C summers in the outback.

